

Powdery Mildew Resistance of Cucurbits at Different Locations

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A sabbatical leave in 1968/69 provided an opportunity for me to visit research institutes in five different countries and test cucurbits for powdery mildew resistance at each location. Sixteen accessions of six cucurbit species were inoculated with powdery mildew spores in greenhouses at Geneva, NY; La Jolla, CA; Wageningen, Holland; Fischelich, Germany; Budapest, Hungary; and Littlehampton, England. Results of this survey of more than 40 years ago were mentioned in correspondence by G. W. Bohn that was recorded by McCreight (9), but they have not been previously published.

***Cucumis melo*:** 'Hearts of Gold' melon was susceptible, whereas 'Perlita', 'Dulce', 'Campo', 'Jacumba', 'Big River', and 'PMR 5' were resistant at each location. 'PMR 45' and 'Gulfstream' melons were susceptible at La Jolla, CA but resistant at all other locations. 'PMR 45' is resistant to race 1 but susceptible to race 2 of cucurbit powdery mildew (7). Race 2 evidently occurred at La Jolla, CA but not at the other locations in this survey since 'PMR 45' was susceptible only at La Jolla.

The resistance of 'PMR 45' to race 1 of cucurbit powdery mildew is conditioned by a single dominant gene, *Pm-1* (8). 'Gulfstream' had the same reaction to powdery mildew at each location as 'PMR 45' and presumably has the same resistance gene. The pedigree of 'Gulfstream' supports this conclusion since 'PMR 45' was one of its parents (1).

Although 'PMR 45' was resistant to powdery mildew at Geneva NY when this survey was made, it was susceptible there in one out of nine years in subsequent tests. Thus, both race 1 and race 2 have occurred there but race 1 has been predominant.

'PMR 5', which was resistant at La Jolla and all other locations tested, is resistant to races 1 and 2 of powdery mildew and has gene *Pm-2* and modifiers for race 2 resistance (2). It is considered to also have the *Pm-1* gene for race 1 resistance (6). 'Big River' had the same reaction to powdery mildew at each location as 'PMR 5' and presumably has the same resistance genes. 'Big River' is a selection of 'PMR 6' (1), which has similar parentage as 'PMR 5' (6). Cohen and Eyal (3) reported evidence that 'PMR 6' as well as 'PMR 5' has the *Pm-2*

gene; they found that 'PMR 5' and 'PMR 6' were both resistant to race 1 and 2 in Israel.

'Campo', 'Jacumba', 'Dulce', and 'Perlita' were also resistant at each location and hence have resistance to both race 1 and 2. Race 1 resistance was associated with race 2 resistance in this survey and also in the tests of Cohen and Eyal (3); they determined that 16 of the 43 cultigens they tested were resistant to race 2 and race 1. Harwood and Markarian (6) noted this association of race 1 and 2 resistance and concluded that 'PMR 5' has the *Pm-1* gene for race 1 resistance and *Pm-2* for resistance to race 2. If this is the case and *Pm-1* and *Pm-2* are independent genes, then some cultivars bred for race 2 resistance without selection for race 1 resistance might lack the *Pm-1* gene and be susceptible to race 1. None of the race 2 resistant cultivars in these tests, however, were susceptible to race 1. Combined resistance to both races could result if *Pm-1* and *Pm-2* are closely linked or if *Pm-2* provides resistance for both races.

When this survey was made powdery mildew of melon and other cucurbits was considered to be caused by *Erysiphe cichoracearum*, but subsequently *Sphaerotheca humuli* var. *fuligenia* (since revised to *Podosphaera xanthii*), was identified as the causal agent (9). Correspondence of G. W. Bohn indicates that race 2 resistant melons were resistant at nearly all sites tested in various parts of the world and he concluded that *Sphaerotheca humilis* var. *fuligenia* was the prevalent species causing powdery mildew of cucurbits (9). Results of this survey corroborate that conclusion.

***Cucumis sativus*:** C7-63 (a cucumber breeding line from C. E. Peterson) and 'Yamaki' were resistant to both race 1 and 2, since they were resistant at La Jolla CA where race 2 was present and at the other locations having race 1. 'Lemon' was susceptible at each location.

***Cucumis anguria*:** *C. anguria* was resistant but not immune to powdery mildew. Only a trace of powdery mildew occurred on this species at Littlehampton, England and no evidence of powdery mildew was observed on *C. anguria* at the other locations. *C. anguria*, therefore, is resistant to both races.

***Cucurbita*:** *C. lundelliana* was resistant and *C. pepo* cv. Scallop was susceptible at each location tested. *C.*

lundelliana has a single dominant gene for resistance to powdery mildew (10). *C. okeechobeensis* subsp. *martinezii*, which has the same resistance gene (4), was used by H. M. Munger to breed germplasm that is the basis for the powdery mildew resistance of squash and pumpkin varieties developed by seed companies. These cultivars, therefore, should be similar to *C. lundelliana* in being resistant to both race 1 and race 2 of powdery mildew.

***Citrullus lanatus*:** Powdery mildew was not considered an important disease of watermelon when this survey was made, but recently it has become a serious problem in some locations (5). 'Klondike R7' watermelon was resistant at each location in this survey and therefore was resistant to both race 1 and 2.

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